

CHAPTER 5

PAILS AND DRUMS

DESCRIPTION, CLASSIFICATION, AND SELECTION FACTORS

DESCRIPTION

Pails

Pails are cylindrical containers made of metal or plastic, with or without a bail handle. They have a capacity of 1 to 12 gallons. Metal pails are constructed of 20 gage or heavier metal. The sides and bottoms of the plastic pails are integral units having a minimum thickness of 0.045 inches and designed so they can be easily stacked. Pails may have fixed heads employing pour spouts of various designs or have full removable heads.

Drums

Drums are cylindrical, straight-walled containers made of metal plastic fiber or plywood, or a combination of these materials. Drums may be provided with rolling hoops pressed or expanded from the body of the drum, or I bars welded to the body. Drums have fixed or removable heads.

Note. Cans are lightweight containers made of metal, paperboard, pulpboard, or a combination of metal and paperboard or pulpboard. Since cans usually are associated with unit packaging, information concerning them is found in FM 38-700.

CLASSIFICATION

Pails and drums are classified as to usage, that is, interior or exterior containers, and reusable and nonreusable containers. They are also classified as to composition--metal and nonmetal.

Interior and Exterior Containers

Interior

Interior containers are covered in FM 38-700.

Exterior

These containers consist of pails, reusable type metal containers, and drums. Exterior containers are designed to withstand rough usage. They may be palletized for convenience in handling.

Reusable And Nonreusable Containers

Reusable

Certain metal containers and drums are designed for reuse. The reusable type is very convenient for the return shipment of repairable items. This feature is particularly advantageous in cases where repairable instruments or accessories can be packed for shipment to the maintenance overhaul activity in the container in which the replacement item was received.

Multiple trip pails and drums may, under certain conditions, be refilled and reused for the shipment of liquid, powdered or granular commodities.

Nonreusable

Single-trip containers usually are discarded after their first use. One type, the strippable drum, is filled with a hot liquid which solidifies after cooling. At destination, the drum is torn away from the enclosed product. Other single-trip containers, designed of light gage metal, are discarded after the first trip because of Department of Transportation (DOT) Regulations, or because the general physical condition of the container would not warrant another trip.

Metal and Nonmetal Containers

Pails and drums are made from metal, although some may be made from fiberboard. The most common metal used for drums is mild steel. Some drums, however, are made of aluminum, nickel, stainless steel, various alloys, or plastics.

USE AND SELECTION FACTORS

Use

A wide range of items and commodities are adaptable for shipping in pails and drums. Liquids, semiliquids, semisolids, granular, flaked, and powdered materials, and solids may be shipped in specified types of these containers. Fragile items and precision instruments may be given the high degree of protection they require by the use of cans or drums. Hazardous materials, such as corrosive liquids, flammable solids, flammable liquids, and acids which cannot be shipped in any other type of container may be shipped in approved types of pails and drums.

Selection

When selecting a pail or drum, it must be remembered that these containers are structurally rigid in design and are dustproof. They may also be waterproof or water-vaporproof. They are easy to mark and afford excellent physical protection of contents during shipment and storage. Pails and drums may be less susceptible to pilferage than some other types of containers. Care must be taken when selecting containers. This is particularly true when selecting a container for shipment of dangerous items; it is also true when selecting the correct container for other items. For example, a square item in a cylindrical container takes about 1-1/2 times the cube required for the same item when packed in a square container. In addition to the loss of valuable cube, excess dunnage is required to fill the voids when a container of the wrong shape is used.

Note. Containers used for shipments of hazardous materials can not be made in accordance with the Department of Transportation (DOT) Specifications after 1 October 1994 and may not be used for shipment after 1 October 1996.

At that time, all containers for Hazardous Materials must be made in accordance with the United Nations Specifications. However, packages filled prior to October 1, 1991, conforming to old requirements, and marked with "INHALATION HAZARD" as appropriate, may be offered for transportation and transported until 1 October 2001.

METAL SHIPPING AND STORAGE DRUMS (MIL-D-6054)

DESCRIPTION

These reusable steel shipping and storage drums are fabricated of 18 to 22 gage steel and incorporate a full removable (recessed or dome style) cover. Bolted-ring or lever lock closures are used to seal the cover onto the drum body (fig 5-1). Gaskets for the covers may be tubular or solid. The covers, gaskets and locking rings are interchangeable within each diameter group. Rolling hoops, which increase the strength, rigidity, and ease of handling, also provide the means of anchoring internal dunnage through the use of split expanding steel rings which fit into the grooves (fig 5-2). When properly sealed, the drums provide a highly effective water-vaporproof container, thus affording a degree of protection suitable for Method 40 and Method 50 preservation.

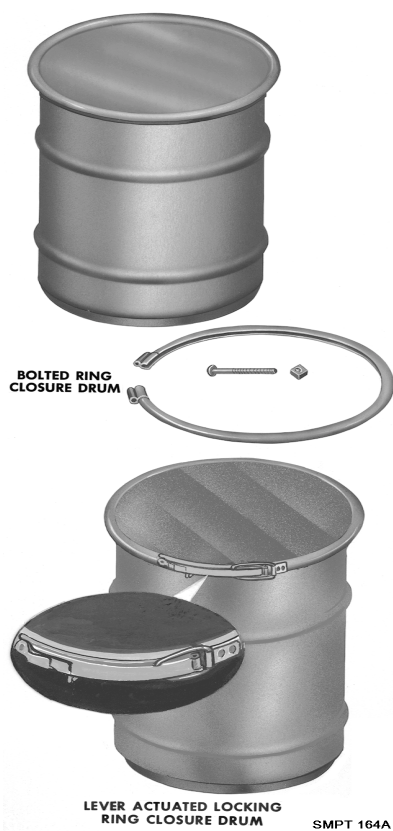


Figure 5-1. Bolted ring and lever actuated type closures (MIL-D-6054).

CLASSIFICATION

The drums are available in various capacities ranging from 3 to 80 gallons, and from 40 to 250 pounds gross weight. The drums are available with inside diameters ranging from 10.5 inches to 30 inches, and inside usable heights ranging from 8.08 to 41.12 inches. The capacities and dimensions, which are available in different combinations, are specified in Military Standards MS27683 and MS27684.

USE

These metal drums are intended to be used for storage and shipment of military material. Drums are required by test to withstand internal pressure of 15.0 pounds per square inch (psi), which will allow them to be used for packing of hazardous materials for transportation by military aircraft. These drums are also used as overpacks for shipments by air of containers which will not meet 15 psi. All size drums are suitable for all methods of preservation where a rigid container is specified. The use of drums are affected by the following factors:

Size and Capacity

There is no specified rule for the selection of a container for a particular item. It is obvious, however, that a container will be selected which will be adequate to contain the item and its blocking and cushioning, yet allow sufficient clearance between the item and the container, or between the blocking and the container walls, to prevent damage to the item when the drum is handled roughly. The container must not be too large, as this will involve the use of extra space and weight. This is a disadvantage when a large number of such drums are to be shipped or stored.



Figure 5-2. Internal locking rings in position (MIL-D-6054).

Internal Locking Rings

The split steel locking ring is designed to fit snugly within the rolling hoop of a metal container and provide a circular flange support for interior blocking (fig 5-3). Care must be used in the design of the interior blocking or other fittings to prevent displacement of the locking ring when loaded. Without some safety device, the locking ring may be loosened by rough handling of the container due to the load imposed on the ring. Figure 5-3 illustrates a safety ring made of plywood. If the item being packed precludes the use of a safety ring, the same function may be performed by using three blocks equally spaced around the internal locking ring and secured to the dunnage by screws. This permits the removal of the blocks for unpacking.

Cup-Type Inserts

The cup-type metal insert was developed primarily as a mount for generators and starters for metal container packing, but it may be adapted to other items. Figure 5-4 shows the metal cup, with plywood fastened to the two ends to aid in blocking while figure 5-5 shows the cup in position, anchored between the locking ring and the container cover. The numerous bolt holes through the cup allow it to be bolted to various items as required.

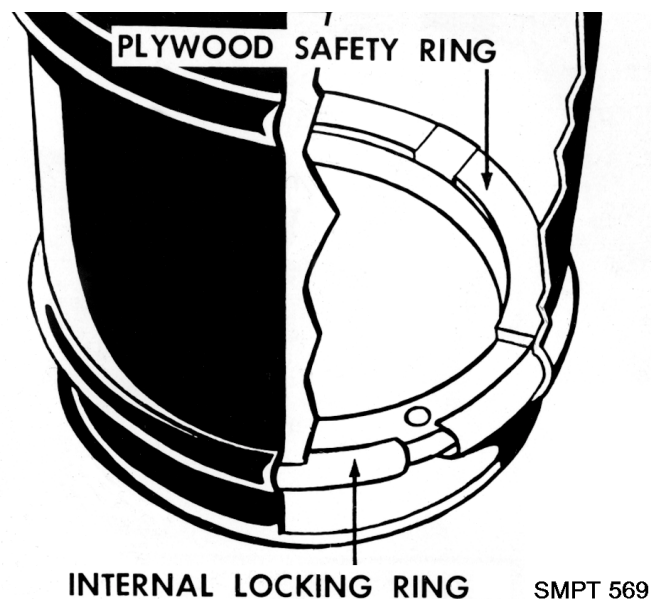
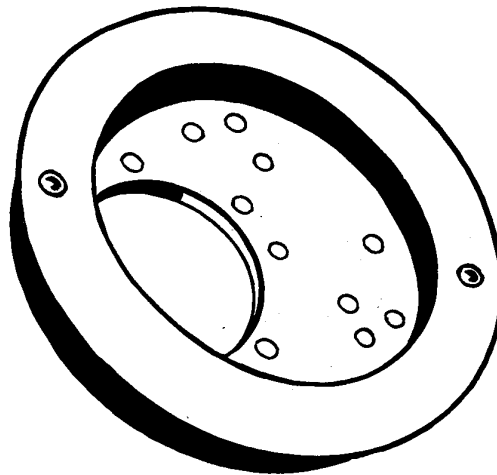


Figure 5-3. Use of internal locking ring (MIL-D-6054).



JMPTC 570

Figure 5-4. Cup-type metal insert (MIL-D-6054).

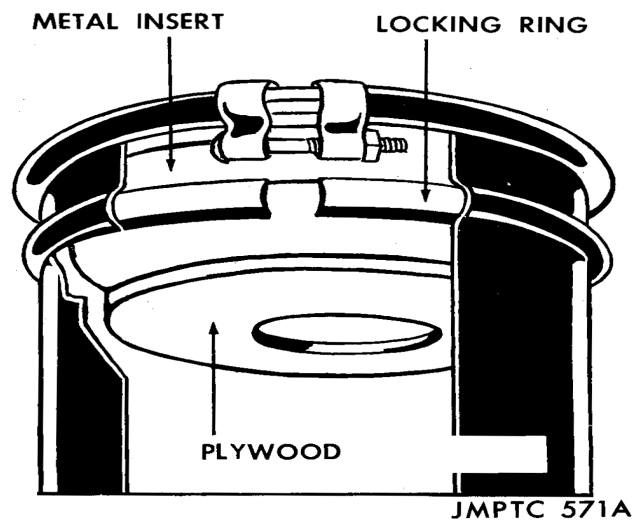


Figure 5-5. Cup-type insert locked in place (MIL-D-6054).

Crate-Type Inserts

The crate-type metal insert is shown in figure 5-6. In use, the item being packed is bolted to two adjacent side members. Plywood disks on the ends of the insert provide some cushioning. The base of the item packed will be insulated from the insert with barrier material conforming to MIL-B-121, Grade A, to prevent the possibility of corrosion from reaction of two dissimilar metals. The maximum weight of the packed item should not exceed 25 pounds for the 10-1/2 inch diameter insert, or 30 pounds for the 13 13/16 inch insert.



Figure 5-6. Item installed in crate-type insert (MIL-D-6054).

Closure

There are two styles of closure for these drums. They are the bolted ring closure and the lever activated locking closure. Closures are made in one of the following manners:

- Bolted-ring closure. The closure may be made in two ways. A device may be used which encircles the locking ring and applies pressure uniformly around the circumference of the ring. The closure is effected by tightening the bolt and nut after uniform pressure is applied at all points around the ring. Care should be taken that the gasket is properly seated in the groove of the cover prior to closure. Alternately, closure may be made by tightening the closure bolt (fig 5-7). The locking ring is tapped at various points about the closure ring while the closure bolt is being tightened. The tightening is continued until at least a minimum torque of 6 foot-pounds plus or minus one-half is applied. In lieu of the specified torque indicating device, closure of an exterior metal container having a slotted-head bolt may be accomplished by using a common screwdriver having an overall length of approximately 17 inches. If this procedure is followed, a spot check of torque with a torque indicating device should be made to assure adequate tensioning. Drums used for shipping commodities by Parcel Post will have the bolt end and protruding edges of the closure ring wrapped, taped, cushioned or otherwise securely covered to prevent damage to postal employees, mail bags, and other containers during shipment. Containers shall be overpacked in fiberboard boxes when this extra precaution is considered necessary. When overpacked, containers shall be secured within the fiberboard box with fiberboard or other suitable dunnage.



Figure 5-7. Tapping locking ring while tightening bolt to insure an effective seal (MIL-D-6054).

- Lever actuated locking closure. When specified in the contract or purchase order a lever actuated type locking ring may be used instead of the nut and bolt type locking ring. Use may be made of a device which encircles the locking ring and applies pressure uniformly about the circumference of the locking ring. The closure is then affected by closing the locking lever and then the wire and lead seal lever which locks the locking lever in position. When the encircling device is not available for use, tension is applied by the locking lever and the ring is tapped repeatedly around the circumference until the ring is seated and the lever is in a locking position. The lever is then locked into place by the wire and lead seal lever lock.

Sealing

Sealing of the container is effected by means of a wire and metal seal which is applied after the closure is complete. Drill 3/32 inch diameter holes in each locking ring lug if they are not already predrilled. The sealing wire is inserted through the holes and the loose ends are twisted together tightly, after which the seal is crimped over the twisted ends of the wire.

Repair and Reuse

The components of the metal shipping and storage drums are repaired and reused as follows:

- Containers, cover, ring, and gasket. Due to the welded construction of an exterior type metal container, dents are considered repairable even though a seam or joint is involved. Dents are removed, painted surfaces retouched, and the container reused or returned to stock. If the container is distorted beyond practical repair, or has a dented or otherwise damaged sealing lip, it is unfit for further use and should be handled accordingly.
- Metal inserts and dunnage. It is not normally considered advisable to repair metal inserts or dunnage, due to the fact that once distorted or deformed, the metal insert would probably be weaker if bent back into the original shape, and thus be incapable of affording the necessary protection. If bent back and reinforced, the spring rate of the material might be greatly changed, thus transmitting any shock directly to the part to be packed and causing damage. However, in an emergency they may be repaired under competent engineering supervision. Immediately upon removal of an item from a metal insert type mount, the interior locking rings and metal inserts must be returned to stock, unless required for immediate reuse. All inserts and interior locking rings are stocked and handled as separate items, and never as component parts of the container assembly.

METAL DRUMS (STANDARD) (MISCELLANEOUS)

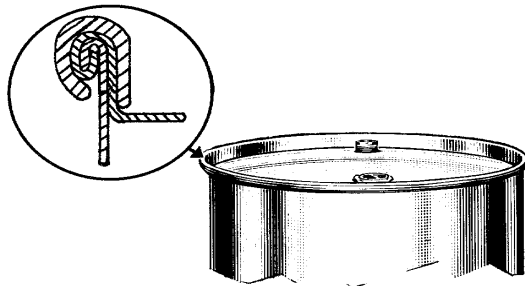
DESCRIPTION

Metal drums are cylindrical, single-wall shipping containers with a capacity which usually ranges from 12 to 110 gallons, 55 gallons being the most common capacity. Metal drums are equipped with rolling hoops which provide additional strength to the side wall and provide for ease of handling. The rolling hoops may be parallel to each other or be offset to facilitate closer nesting for palletization and carloading. Metal drums may have full removable heads or tight heads (fixed) (fig 5-8). A drum with a tight head is

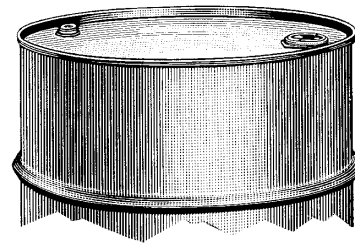
provided with a 2 inch diameter bung and 3/4 inch diameter vent hole for filling and emptying. These openings may be on the drum head or in the drum body. Drums may be unlined or lined with lacquer, varnish, enamel and plastics, rubber, lead, or aluminum.

CLASSIFICATION

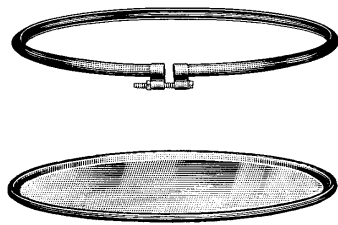
The DOD uses many kinds of drums for the shipment of various materials. Listed in table 5-1 is the Federal specification number and title (PPP-D-729) and the DOT specification number and title. Figure 5-8 shows the type of drum classified in Federal Specification PPP-D-729 and the corresponding DOT-5B. DOT designates the DOT 17E and DOT-37A drums as single-trip containers.



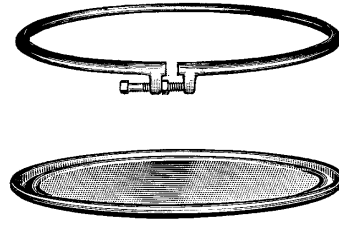
TIGHT HEAD WITH CHIME
REINFORCEMENT
PPP-D-729, TYPE I DOT-5B



TIGHT HEAD WITHOUT CHIME
REINFORCEMENT
PPP-D-729, TYPE II DOT 17E



FULL REMOVABLE COVER WITH
BOLTED TYPE LOCKING RING
PPP-D-729, TYPE III
UFC RULE 40 NMFC RULE 260



FULL REMOVABLE COVER WITH
BOLTED TYPE LOCKING RING
(DROP FORGED LUG)
PPP-D-729, TYPE IV DOT 17H

SMPT 2287C

Figure 5-8. Types of drum closures and typical markings for domestic drums (PPP-D-729).

Table 5-1. Specifications and Titles of Metal Drums.

Federal specification number and title	DOT specification, number and title
PPP-D-729 drum, metal, 55 gallon (for shipment of noncorrosive materials) Type I..... (Class A-Closehead, Class B-Openhead)	DOT-5B Steel barrels or drums. Removable head containers which will pass all required tests are authorized.
Type II.....	DOT-17E Steel drums, single trip container. Removable head containers not authorized.
Type IV.....	DOT-17H Steel drums, single trip container. Removable head required.
Type V.....	DOT 5A - Straight side, unlined steel for acid and corrosive liquids.
Type VI.....	DOT 5C - Straight side, corrosion-resistant steel for acid and corrosive liquids.
Type VII.....	DOT 5D - Closehead straight side, lined steel for acid and corrosive liquids.

USE

The tight (fixed) head drums are primarily used for the shipment of liquids. Emptying may be through either the filler or vent hole, although the filler hole is most commonly utilized. A spout may be affixed to the threaded portion of the hole to facilitate emptying. A pump, either hand or hydraulically operated, may be utilized in the hole. Greases, dry powdered, flaked or granular materials, etc., may be shipped in a full removable head drum. The full removable head drum provides the easiest access to the contents.

REUSE

Most metal drums are initially filled at the manufacturer's plant and are reusable except for single-trip containers. When empty, the drums may be returned to destination for refilling. If refilling is done by the initial user, care should be taken not to reuse drums which have been used to ship hazardous materials, until such drums are cleaned and tested in accordance with UN recommendations. Failure to do so may create a serious health hazard. When filling drums with dangerous materials, only UN recommended type drums may be used for that commodity. The drum specification number, the name, initial, or symbol of the manufacturer; the letters "US" to indicate that the drum is the property of the Government; the letters "STC" if the drum is a single-trip container; and a numerical indication of the thinnest gage of metal used in the construction, the capacity of the drum in gallons, and the year of manufacture are embossed on the bottom of the drum (fig 5-8). For example, 18-55-74 means that drum is 18 gage metal, 55-gallon capacity, and was made in 1974. When filling the drums, the contents may not exceed the marked capacity minus 2 percent for outage.

FIBER DRUMS (PPP-D-723)**DESCRIPTION**

Fiber drums are cylindrical shipping containers with bodies made of fiberboard, either lapped or parallel wound (convolutely) in the form of a hollow cylinder. They may be either single unit or telescopic body type. The heads are of metal, wood, plywood, or fiberboard. There are many characteristics of fiber drums which give them advantages over other types of containers. Included among these are cleanliness, durability, low uniform tare weight, retard temperature fluctuation, easy opening and closing, water and moisture resistance, stackability, easy handling, product protection and wide range of diameters and heights. Fiber drums are easily opened and reclosed.

CLASSIFICATION

Fiber drums are available in the types, grades, and classes shown in table 5-2.

USE

The intended uses are shown in table 5-2. The other factors covered by this paragraph must also be observed.

Domestic Type (Type I)

Fiberboard drums covered by this specification are intended for use as domestic shipping containers. Grade A drums are for dry or solid materials. Class 1 regular construction should normally be used; class 2 foil laminated should be used for highly hygroscopic materials needing a barrier, such as desiccants. Use of grade B drums should be limited to semisolid materials having a consistency similar to asphalt, lubricating grease, petrolatum, refractory cement, caulking compounds, roof coatings, adhesives, textile sizing, and food products such as jellies and fondants. The consistency of asphalt materials and lubricating greases should not exceed 350 units when measured in accordance with method 311.6 of FED-STD-791 (ASTM D 217). Class 2 is normally used when high moisture barrier is required or when the type I, grade A, class 2 is supplemental by the aluminum liners it may be used to deter electrostatic charges and prevent explosion. Grade C drums are for hot-poured materials that solidify on cooling and should be limited to materials poured at temperature not exceeding 400°F. Grade E drums are for nonregulated liquids or articles in liquids.

Type I, Grade D

This is also intended for normal overseas shipment. When substituted for type II drums, the drums shall be marked type II, overseas type (nonweather resistant).

Type II Overseas (Nonweather Resistant)

Fiberboard drums covered by this specification are intended for use for normal overseas shipment where numerous handling and storage at destination are not anticipated.

Type III Overseas (Weather Resistant)

Fiberboard drums covered by this specification are intended for unprotected weather exposure usage for added protection in high humidity or outdoor storage environment.

Exceptional Requirement

Exceptional commodities, especially dangerous articles (hazardous material), may require better material and construction requirements than are covered by this specification.

Compliance Marking

In addition and adjacent to the drum manufacturer's markings required by Uniform Freight Classification, National Motor Freight Classification or DOT rules or regulations, each drum is stamped or printed in black capital letters not less than 3/16 inch in height with information concerning the type, class, grade, specification number, etc. For example, the information for the Type I drum is shown below:

Type I
(DOMESTIC TYPE)
COMPLIES WITH FED. SPEC. PPP-D-723J
FOR DOMESTIC SHIPMENT _____
GRADE _____ CLASS _____
MAX. WT. OF CONTENTS _____ LBS.
MAX. CAPACITY OF CONTENTS _____ GAL.

In addition, Grade D drums shall have stenciled or printed on the cover and side wall in letters not less than 3/4 inch in height, the following precautionary markings:

STAND ON END
KEEP COOL AND DRY

Only contents of the type, grade, and class as indicated in the compliance markings are to be placed in these drums. The weight and capacity must also conform to these requirements.

Table 5-2. PPP-D-723 Fiber drums

<u>Types, grades, and classes.</u> Fiber drums covered by this specification shall be of the following types, grades, and classes, as specified.	
Type I Type II Type III	- Domestic (nonweather resistant) - Overseas (nonweather resistant) - Overseas (weather resistant)
Grade A Grade B Grade C Grade D Grade E	- For dry and solid material (applicable to all types) - For semiliquid material (applicable to all types) - For hot poured materials that solidify on cooling (applicable to types I and II only) - For rolled or cylindrical items (applicable to types I and II only) - For liquids or articles in liquid - nonregulated (applicable to all types)
Class 1 Class 2 Class 3 Class 4 Class 5	- Regular construction (applicable to only types I and III grade A drums) - Foil laminated construction (applicable to only types I and III grade A drums) - Integral plastic lining (applicable to only grade E drums) - Semi-rigid plastic component (open head loose liner applicable to only grade E drums) - Molded rigid one-piece plastic component (closed head liner) applicable to only grade E drums

Closure

The closure of fiber drums must be such that they may be opened and reclosed by hand or simple tools. These are three types of closures which are commonly used. They are the friction-type or telescopic slip on covers, which are secured with pressure sensitive tape, lever-activated locking bands, and the metal clip or lug closure (fig 5-9).

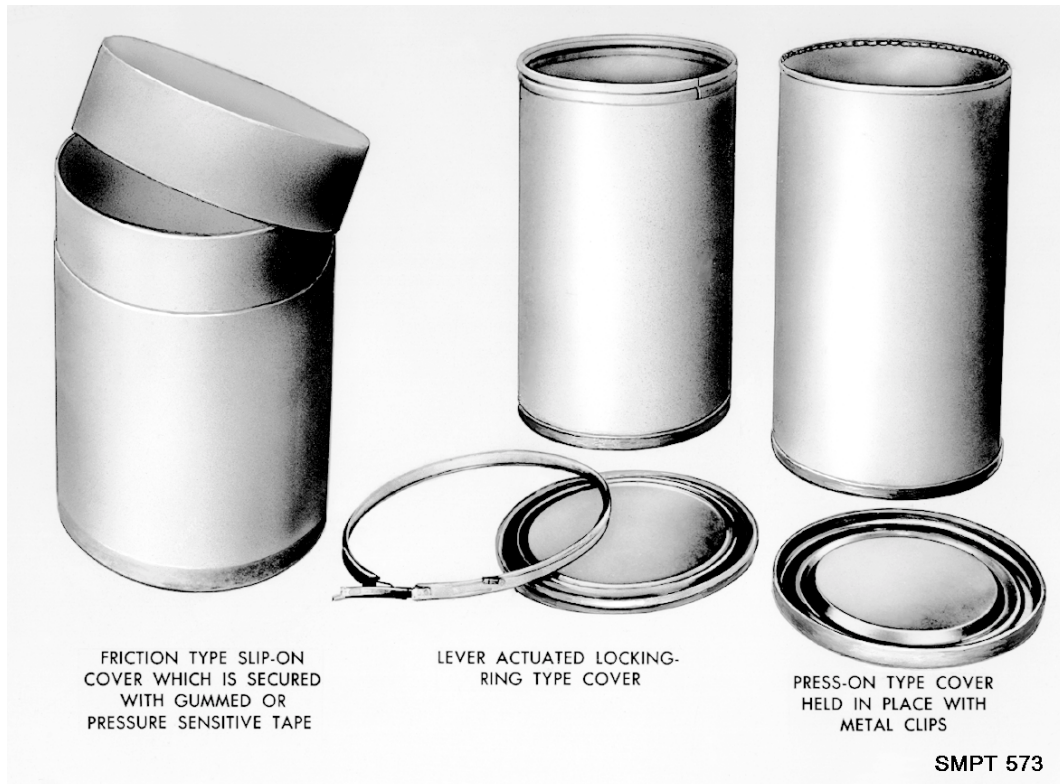


Figure 5-9. Types of fiber drum closures (PPP-D-723).